

REMARKS

Claims 7-9 and new claims 10-18 are now in this application. Claims 7 and 8 are rejected. Claim 9 is objected to. Claims 1-6 are previously cancelled. Claims 7-9 are amended herein to clarify the invention, to broaden language as deemed appropriate and to address matters of form unrelated to substantive patentability issues. Other formal matters are attended to that were not addressed by the Examiner and accordingly are considered unrelated to substantive patentability issues.

Drawings

The Examiner indicated that Fig. 7 should be designated as "Prior Art".

Submitted herewith is proposed revised Fig. 7 in which the notation "Prior Art" is provided.

In view of the submission of proposed revised Fig. 7, it is respectfully submitted that the Examiner's objection to the drawings has been overcome and should be removed.

Specification

In response to the objection to the Abstract, the Abstract is amended to change the word "row" to "raw".

The specification is also amended to remove the designation of the radius of the peripheral region as H1.

AMENDMENTS TO THE DRAWINGS:

Please find accompanying this response a replacement sheet for Fig. 7. The drawing amendments effect the following change:

The notation "Prior Art" has been added.

In view of the changes to the Abstract and specification, it is respectfully submitted that the Examiner's objections to the Abstract and disclosure have been overcome and should be removed.

Claim Rejections-35 U.S.C. §112

Claim 8 is rejected under 35 U.S.C. §112, second paragraph, on the grounds that "the raceway surface" lacks antecedent basis.

Claim 8 is amended to recite that the inner ring of the rolling bearing is entirely hardened by heat treatment in order to improve abrasion resistance and strength of "a raceway surface defined by said inner ring".

In view of the change to claim 8, the Examiner's rejection of the claim under 35 U.S.C. §112, second paragraph, has been overcome and should be removed.

Claim Rejections-35 U.S.C. §103

Claim 7 is rejected under 35 U.S.C. §103(a) as being unpatentable over the Bertetti reference (U.S. Patent No. 5,536,075). The Examiner refers to the plastically deformable ring 41 (see Fig. 5) and takes a position that it would have been obvious to construct this retaining ring as a caulked portion.

The Examiner's rejection is respectfully traversed on the grounds that Bertetti does not disclose, teach or suggest a bearing device including all of the features of claim 7.

Claim 7 is directed to a bearing device including a shaft body 12 and a rolling bearing which is mounted around the shaft body. The shaft body 12 has a

caulked portion 3 at its free end which is “bent outward in a radial direction” for pushing an end face of an inner ring 21 of the rolling bearing. An end surface of the inner ring 21 constitutes a crimp contact portion (peripheral region 30) in contact with the caulked portion 3. The hardness of the peripheral region 30 of an inner peripheral corner 21a of the inner ring 21 is set at a value capable of plastically absorbing a load at the time of caulking.

An advantage of this is that the inner peripheral corner 21a is relatively soft and is plastically deformed when the caulking portion 3 is formed causing the inner ring 21 and shaft body 12 to strongly adhere to one another (see the specification at page 8, lines 1-5).

Bertetti describes a wheel hub unit for a vehicle in which a raceway surface of a bearing is rigid while remaining portions are softened by tempering. A collar or appendage 35, formed from the inner ring 15, is deformed by a punching tool 40 to cause the inner ring 15 to be fixed to the shaft 19. As shown in Fig. 5, a plastically deformable ring 41, separate from the inner ring 15, can be used to lock the inner ring 15 to the shaft 19.

In contrast to the invention, Bertetti does not disclose a shaft having a cylindrical portion which is bent radially outward (away from a central axis of the bearing device) from an position inside of an inner ring to form a crimped part which fixes the inner ring to the shaft body as in the invention. In the invention, the inner ring 21 is subjected to a force through the caulking portion 3 of the shaft body 12 and

fixed thereby. By contrast, in Bertetti, there is no part of the shaft which is bent to fix the inner ring in position but rather a part of the inner ring is bent into engagement with the shaft. As shown in Fig. 5, the ring 41 is arranged only against the end face of the inner ring 15 and appears to be bent radially inward into engagement with the shaft 19. Thus, the shaft 19 of Bertetti does not include any caulking portion which is part of a shaft and used to fix an inner ring in position.

As such, when the Bertetti bearing device is formed, stress is transferred to the raceway surface potentially damaging the operation of the bearing device. On the other hand, in view of the structure of the inner ring 21 and caulking portion 3 of the shaft body 12, stress arising from the caulking operation is absorbed through plastic deformation of the inner ring 21 and does not reach or affect the raceway surface of the inner ring 21.

Accordingly, Bertetti does not disclose a roller bearing including all of the features of claim 7 and therefore it cannot be modified to render the claimed embodiment of the invention unpatentable.

Claim 7 is also rejected under 35 U.S.C. §103(a) as being obvious by the Kashiwagi et al. reference (U.S. Patent No. 6,398,419) in view of the Bertetti reference.

Kashiwagi et al. does not disclose a bearing device including an inner ring having an end surface constituting a crimp contact portion in contact with a caulked

portion wherein hardness of a peripheral region of an inner peripheral corner of the inner ring is capable of plastically absorbing a load at the time of caulking.

Therefore, Kashiwagi et al. cannot be modified in view of Bertetti to render the embodiment of the invention set forth in claim 7 unpatentable.

In view of the changes to claim 7 and the arguments presented above, it is respectfully submitted that the Examiner's rejections of claim 7 have been overcome and should be removed and that the present application is now in condition for allowance.

New Claims

Claims 10-18 are added. Claims 10-17 recite additional features of the bearing device of claim 7. Claim 18 is an independent claim which includes the subject matter of claims 7 and 9 as previously set forth. In view of the Examiner's indication of allowability in claim 9, claim 18 should be patentable over the prior art of record.

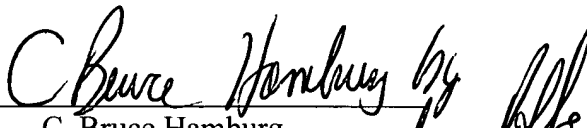
Petition for Extension

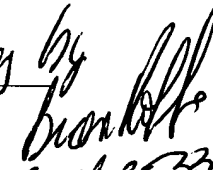
Applicant respectfully requests a three month extension of time for responding to the Office Action. Please charge the fee of \$950 for the extension of time to Deposit Account No. 10-1250.

In light of the foregoing, the application is now believed to be in proper form for allowance of all claims and notice to that effect is earnestly solicited. Please charge any deficiency or credit any overpayment to Deposit Account No. 10-1250.

Respectfully submitted,
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enc: Replacement and Annotated drawing sheets of Fig. 7

Ser. No. 10/630,429

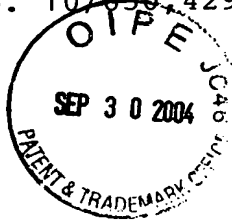


FIG. 7

PRIOR ART

